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Tuna Research

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OBSERVATIONS FROM INTERNATIONAL OCEANOGRAPHIC EXPEDITIONS RELEVANT TO TUNA ECOLOGY

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Rome, 1966

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Special groups of synopses are identified by symbols followed by classification numbers based on indexed code of "Current Bibliography":

SAST Data concerning certain species and fish stocks.

MAST Information on methods and subjects.

OT Oceanographic data.

IT Limnological data.

and

CART Information concerning fisheries and resources of certain countries and regions (FID/S).

Special groups of Technical Papers are identified by:

RE Indexed lists of experts and institutions drawn from Registers maintained by the Fishery Resources and Exploitation Division.

CB Lists of periodicals, special sections of "Current Bibliography for Aquatic Sciences and Fisheries", special bibliographies and papers concerning documentation problems.

MFS Provisional editions of "FAO Manuals in Fisheries Science".

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FAO Fisheries Synopsis FR /S (No.)

Des catégories spéciales de synopses sont identifiées à l'aide de symboles suivis des chiffres de classification basés sur le code d'indexation de la "Current Bibliography":

SAST Données sur certaines espèces et populations de poissons.

MAST Renseignements sur des méthodes et des sujets.

OT Données océanographiques.

IT Données limnologiques.

et

CART Renseignements sur les pêcheries et les ressources de certains pays et régions (FID/S).

FAO Fisheries Technical Paper FR /T (No.)

Des catégories spéciales de documents techniques sont identifiées à l'aide des symboles suivants:

RE Listes indexées d'experts et institutions tirées des registres tenus à jour par la Division des ressources et de l'exploitation des pêches.

CB Listes de périodiques, des sections spéciales de la "Current Bibliography for Aquatic Sciences and Fisheries", des bibliographies particulières et des articles sur les problèmes de documentation.

MFS Editions provisoires des "Manuels FAO de science halieutique".

Il arrive que certains documents portent d'autres numéros d'identification, comme c'est le cas s'ils ont été préparés pour une réunion dont les documents ont été marqués à l'aide d'un autre système.

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Grupos especiales de sinopsis se distinguen con las siglas siguientes, seguidas por números de clasificación que se basan en las claves de los índices de la "Current Bibliography".

SAST Datos relativos a ciertas especies y poblaciones.

MAST Sinopsis sobre métodos y materias.

OT Sinopsis sobre oceanografía.

IT Sinopsis sobre limnología.

y

CART Información sobre los recursos acuáticos vivos de algunos países y regiones (FID/S).

Grupos especiales de documentos técnicos se identifican por las siglas siguientes:

RE Listas índices de expertos y de instituciones tomadas de los registros que se llevan en la Dirección de Recursos Pesqueros y Explotación.

CB Listas de periódicos, secciones especiales de la "Current Bibliography for Aquatic Sciences and Fisheries", bibliografías especiales y trabajos relativos a los problemas de documentación.

MFS Ediciones provisionales de los "Manuales de la FAO de Ciencias Pesqueras".

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OBSERVATIONS FROM INTERNATIONAL OCEANOGRAPHIC EXPEDITIONS RELEVANT TO TUNA ECOLOGY

by

FAO Expert Panel for the Facilitation
of Tuna Research (Tuna Ecology)

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS
Rome, April 1966

MI/44748

PREPARATION OF THIS PAPER

At its first session (June 8-12, 1964) the FAO Expert Panel for the Facilitation of Tuna Research recommended the formation of a working party which, by correspondence, would develop a list of those observations relevant to tuna ecology studies which it would be desirable to include in the programmes of international oceanographic expeditions and other large area investigations. It was recommended also that the proposals of the working party should be transmitted to the Inter-governmental Oceanographic Commission under UNESCO, the World Meteorological Organization and other interested bodies. The Working Party of Experts on Tuna Ecology was formed early in 1965 to undertake this task. Its membership was:

G.V. Howard, Convenor, U.S.A.
T.S. Austin, U.S.A.
J. Hamre, Norway
H. Nakamura, Japan
A.G. Nicholls, Australia
E. Postel, France
H. Rosa, FAO
K. Terada, FAO
M. Uda, Japan

The working party reported to the Expert Panel on March 2, 1966 and in accordance with the recommendation of the first session its report has now been reproduced for transmission to the persons and organisations concerned. In addition to the IOC and WMO copies are being sent for their information and any necessary action to SCOR, IPFC, GFCM, CARPAS, ICES, ICNAF, I-ATTC. The report is also being transmitted to the members of the Expert Panel and of the FAO Advisory Committee for Marine Resources Research, FAO Regional Fisheries Officers and Field Staff. Further distribution of the report will be made on the basis of recommendations by the second session of the Expert Panel and by the ACMRR.

H. Rosa Jr.,
Secretary, FAO Expert Panel for Facilitation
of Tuna Research

S. J. Holt,
Acting-Director, FAO Fishery Resources
and Exploitation Division

18.4.66.

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"Current Bibliography" entry :

FAO. Expert Panel for the Facilitation of Tuna Research (Tuna Ecology) (1966) M
FAO Fish.tech.Pap., (62): 7p.
Observations from international oceanographic expeditions relevant to tuna ecology

Lists observations relevant to studies of tuna ecology recommended for inclusion in oceanographic expeditions and obtained from unmanned buoys.

OBSERVATIONS FROM INTERNATIONAL OCEANOGRAPHIC EXPEDITIONS RELEVANT TO TUNA ECOLOGY

Report of the Working Party of Experts on Tuna Ecology
of FAO Expert Panel for the Facilitation of Tuna Research

Nearly all the physical and chemical and certain of the biological observations collected by oceanographic expeditions are furnished to World Data Center A (WDC-A) in the United States or to World Data Center B (WDC-B) in the U.S.S.R. Routine weather observations taken from oceanographic research vessels enter national depositories through the World Meteorological Organization (WMO) system for collection of weather data from ships at sea. These establishments provide the means for tuna researchers and other scientists to obtain the bulk of the observations which are made on oceanographic expeditions.

The kinds of observations and the temporal and spacial coverage which scientists engaged in research on the ecology of tunas can obtain from international oceanographic expeditions and other large-scale oceanic investigations depend largely on the nature and purpose or scope of such expeditions. Some expeditions, such as the International Indian Ocean Expedition (IIOE), are concerned with extensive ocean regions and with the many aspects of oceanography - geology, physics, chemistry, and biology. It is more common, however, for expeditions to have a more specific or narrower purpose and it is rare for scientific parties on particular cruises (vessels) to be involved in all aspects of oceanography. Oceanographic expeditions usually are of three general types: (1) geo-physical and geological; (2) physical and chemical; and (3) biological. There is commonly some overlap in the kinds of observations taken on the three main types of expeditions listed, particularly between those concerned with physical and chemical studies and those devoted to biological problems, and especially when fishery-oriented groups are involved in the biological studies. Biological expeditions or cruises normally collect the broadest list of observations of interest to tuna researchers, those dealing with geophysics and submarine geology make the least kinds, and expeditions for physical and chemical oceanography usually fall in an intermediate position.

The Working Party felt that the logical approach to the preparation of a list of observations relevant to studies of tuna ecology which could be recommended for inclusion in oceanographic expeditions was to bear in mind the capability and interest of expedition scientists to make the observations described. It would be unrealistic to recommend, or even suggest, a list of observations which would interfere with the primary objectives of expeditions. Rather, it seemed preferable to assemble the list in a manner which would distinguish between observations which would ordinarily be obtained on particular types of expeditions and observations which could be obtained additionally if scheduled on a "not-to-interfere" basis. Some of the additional observations undoubtedly could be taken by the scientific parties if the need for them were known; others could be obtained if scientists or technicians from laboratories concerned with tuna ecology joined the cruises.

With the above considerations in mind, a list of expedition observations was compiled according to three types of oceanographic expeditions and an attempt was made to distinguish between observations which are normally taken on the three types of expeditions and additional observations which could be obtained on a "not-to-interfere" basis. Also, an effort was made to separate those observations which are usually taken with the vessel "underway" and those which are made "on station".

Although preparation of the list in the manner described involved considerable subjectivity, it seems preferable to an all-inclusive list. It is more realistic to expect cooperation from international and other large-scale oceanographic expeditions if the requirements of tuna laboratories can be met with the minimum of interference to the particular objectives of the expeditions.

The principal types of expeditions covered and categories of observations recognized were:

Type of Expedition:

1. Geological and geophysical oceanography

2. Physical and chemical oceanography

3. Biological oceanography.

Categories of Observations:

1. Underway: (a) no change in speed of advance of vessel; (b) reduction in speed of advance to lower and retrieve instruments and during period instruments are overboard; (c) brief stop for surface samples such as plankton or water.

2. Station: Vessel stopped ½ hour or more for surface and subsurface observations and collections.

3. Not-to-interfere basis: Situation where expedition scientists could augment their regular observations at the request of laboratories engaged in studies of tuna ecology or, alternatively, such laboratories could assign scientists or technicians to expedition vessels to make the additional observations.

Appendix I gives a list of observations which should be obtained from oceanographic expeditions and unmanned buoys. It was decided to include the list of buoys because such platforms will soon become important tools for large-scale oceanic investigations and because time-series observations are vital for studies of tuna ecology and the need for such observations should be made known.

Suggestions and comments are offered concerning the dissemination of the observations, standardization of methods, inter-calibration of instruments and exchange of information on new instrumentation, and arranging for observations which are made on a not-to-interfere basis.

Comments and suggestions

Transmission of the list of observations given in the Appendix (which need to be recommended for inclusion in international oceanographic expeditions and other large-scale area investigations) to FAO, UNESCO (IOC), WMO and other interested bodies, should make known the needs of tuna researchers to those planning and conducting large-scale international and national oceanographic expeditions. Media (WDC-A, WDC-B, and national depositories for meteorological observations) exist from which tuna laboratories may obtain the majority of the kinds of observations available from such expeditions. Readouts of oceanographic data obtained from the World Data Centers usually indicate methods followed in collection and processing.

The Manual Series (6 issues through 1965) published by the U.S. National Oceanographic Data Center (location of WDC-A) indicates the kinds of observations which are now available from oceanographic expeditions. The list is expected to grow. All physical and chemical observations included in our list either are included, or are expected to be in the near future. Methods of making physical and chemical observations, primary productivity, phytoplankton pigment, and zooplankton are presently included at the World Data Centers and, for these observations, methods are also being standardized. Laboratories should be encouraged to forward the remaining biological observations to the World Data Centers. Such action would also stimulate standardization. The same suggestion applies to bathymetric data. Attention is drawn to the publication of the U.S. National Academy of Sciences Committee on Oceanography entitled, "Recommended Interim Procedures for Measurements in Biological Oceanography".

International Marine Science, a quarterly prepared by UNESCO and FAO, published by UNESCO, offers the means for tuna researchers to keep currently informed about international and regional oceanographic expeditions. The information, however, is not always as complete as is desired with respect to the suite observations to be made on particular expeditions and information on all national programs is not supplied to IOC and FAO. Nations should be encouraged to supply more complete information. IOC and FAO should be able to encourage improvements in these areas. The same organizations could assist in the matter of standardization of methods where necessary, in arranging for intercalibration of instruments, and in disseminating information concerning new instruments, especially those which automate manual analyses. One might also serve as a central

service to advise where data which are not available from the World Data Centers are stored. Particularly important is the need for one of the two organizations to assist in arrangements for obtaining "not-to-interfere" observations.

APPENDIX I

List of observations which it is proposed should be obtained from oceanographic expeditions and moored instrumental oceanographic stations (unmanned buoys).

List of Expedition Observations

I. Geological and geophysical oceanography expeditions

A. Underway observations

1. Surface meteorological observations at 0000, 0600, 1200, and 1800 daily.

2. Incident radiation (recording pyranometer).

3. Surface temperature - continuous record or at intervals with bucket thermometer.

4. Surface salinity - continuous record or water samples bottled at intervals for analyses aboard or ashore.

5. Subsurface temperature - standard bathythermograph (BT) lowerings or expendable bathythermograph (XBT) drops at 6-hour intervals (or at closer if possible).

6. Bathymetry - continuous record with precision depth recorder.

B. Station observations

1. Available hydrographic station observations for temperature, salinity, dissolved oxygen, etc.

2. Available current measurements.

C. Not-to-interfere observations

1. Underway observations - any or all additional underway observations listed for biological oceanography expeditions.

2. Station observations - any or all additional station observations listed for physical and chemical and biological oceanography expeditions.

II. Physical and chemical oceanography expeditions

A. Underway observations

1. Surface meteorological observations at 0000, 0600, 1200, and 1800 daily.

2. Incident radiation (recording pyranometer).

3. Surface temperature - continuous record or at intervals with bucket thermometer.

4. Surface salinity - continuous record or water samples bottled at intervals for analyses aboard or ashore.

5. Subsurface temperature - standard bathythermograph (BT) lowerings or expendable bathythermograph (XBT) drops at 6-hour intervals (or closer if possible).

6. Bathymetry - continuous record with precision depth recorder (if navigation instruments adequate).

7. Record of ocean fronts (siwome) encountered.

B. Station observations

1. Hydrographic station observations to 1200 meters - temperature, salinity, dissolved oxygen, inorganic phosphate, nitrite, nitrate, silicate.

2. Light - light extinction and/or transparency to 200 meters at full daytime hydrographic stations.

3. Current measurements (surface and subsurface) - with drogues (e.g. parachutes), current meters, or electronic devices (GEK).

C. Not-to-interfere observations

1. Underway observations

(a) Surface micronekton (microbiomass) - continuous sampling with high speed samplers, night-time periods only.

(b) Any or all additional underway observations listed for biological oceanography expeditions.

2. Station observations

(a) Upper air soundings.

(b) Biological observations at hydrographic station closest to mid-day:

i. chlorophyll a - near surface (filter pads analyzed ashore if necessary);

ii. primary productivity - near surface ^{14}C uptake (incubate by simulated in situ method);

iii. zooplankton - oblique net tow with meter net from 300 meters for biomass estimates and larval fishes.

(c) Any or all additional station observations listed for biological oceanography expeditions.

III. Biological oceanography expeditions

A. Underway observations

1. Surface meteorological observations at 0000, 0600, 1200, and 1800 daily.

2. Incident radiation (recording pyranometer).

3. Surface temperature - continuous record or at intervals with bucket thermometer.

4. Surface salinity - continuous record or water samples bottled at intervals for analyses aboard or ashore.

5. Subsurface temperature - standard bathythermograph (BT) lowerings or expendable bathythermograph (XBT) drops at 6-hour intervals (or closer if possible).

6. Bathymetry - continuous record with precision depth recorder (if navigation instruments adequate).

7. Record of ocean fronts (siwome) encountered.

8. Surface micronekton (microbiomass) - continuous sampling with high speed samplers, night-time periods only.

9. Continuous daylight watch for bird flocks and fish schools.

B. Station observations

1. Hydrographic observations - two full stations daily (near mid-day and midnight) to 1200 meters - temperature, salinity, dissolved oxygen, inorganic phosphate, nitrite, nitrate, silicate. At other stations - temperature and salinity to 500 meters.

2. Light - light extinction and/or transparency to 200 meters at full daytime hydrographic stations.

3. Chlorophyll a and primary productivity (at full hydrographic stations near mid-day) measurements to depths of 100, 50, 25, 10 and 1 percent of incident light penetration; C^{14} analysis with simulated in situ incubation.

4. Zooplankton - (at full hydrographic stations near mid-day and midnight) oblique 1-meter net tow from a depth of 300 meters to the surface and a consecutive or simultaneous 1-meter net tow at the surface for biomass estimates and larval fishes.

C. Not-to-interfere observations

1. Underway observations

(a) Trolling for tunas - daylight hours catches identified by species, length measurements.

(b) Additional observations specifically requested by tuna laboratories.

2. Station observations

(a) Current measurements (surface and subsurface) with drogues, current meters, or electronic devices (GEK).

(b) Dip net collections - juvenile scombroid fishes (taken under lights with dip nets at night stations).

(c) Additional observations specifically requested by tuna laboratories.

List of Unmanned Buoy Observations

I. Sea surface observations

1. Sea surface water temperature
2. Barometric pressure
3. Air temperature
4. Wind velocity and direction
5. Humidity
6. Solar radiation.

II. Subsurface observations

1. Water temperature at several known depths through the mixed layer (top of thermocline);
2. Salinity, oxygen concentration, and visible irradiance (to obtain attenuation coefficient, k) at several known depths down to 200 meters (water temperature at same depths when sensors are available for these properties).

Note: Suitable sensors for use on buoys have not been developed yet for those properties underlined.

FAO FISHERIES TECHNICAL PAPER

This is one of a series of Technical Papers (see inside front cover) dealing with aspects of the work of FAO Fisheries Division, Biology Branch, including the review of pertinent information on particular topics, to meet the requests for assistance, for presentation to technical and scientific meetings, etc. Extra copies can be obtained by application to:

Biological Data Section
Fishery Resources and Exploitation Division
FAO, Rome, Italy

(Papers issued since January 1966)

FIb/T41	**Manual of methods for fish stock assessment Part III. Selectivity of fishing gear**	**January, 1966**
FRm/T60	Establishment, structure, functions and activities of international fisheries bodies - III - Regional Fisheries Advisory Commission for the South West Atlantic (CARPAS)	February, 1966
FRm/T62	Observations from international oceanographic expeditions relevant to tuna ecology	April, 1966